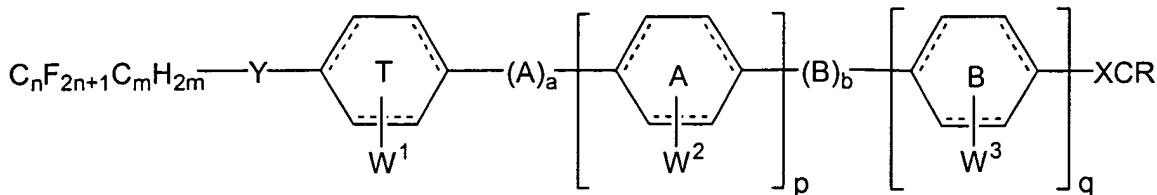


CLAIMS

We claim:

1. A chiral, non-racemic liquid crystal composition which comprises an achiral liquid crystal host and up to about 100% by weight of one or more chiral, non-racemic compounds having the formula:



wherein n and m are integers ranging from 1 to about 20;

a, b, p and q are either 0 or 1, when p is 0, a is 0 and when q is 0, b is 0;

Y is a single bond or an oxygen;

X is selected from the group consisting of a single bond, oxygen, -CO-, -O-CO-, and -CO-O-;

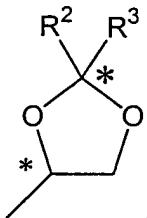
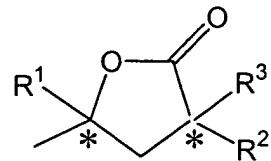
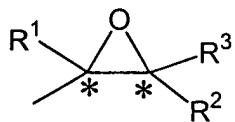
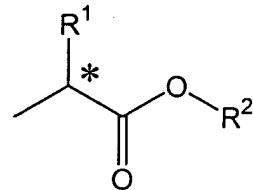
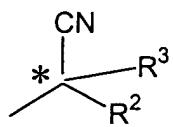
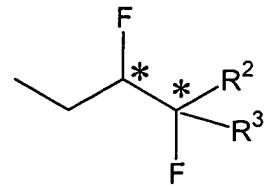
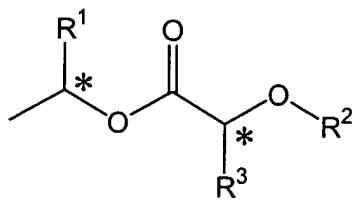
CR is a chiral, non-racemic tail group except that CR cannot be a chiral hydrocarbon tail;

A and B, independently, are linker groups that can be selected from the group consisting of -CO-, -O-CO-, -CO-O-, -CH₂-CH₂-, -CH₂-CH₂-O-, -O-CH₂-CH₂-, -C≡C-, -C=C-, and -C=C-C=C-;

W¹, W², and W³, independently, represent one or more optional substituents on core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, nitro and nitrile; and

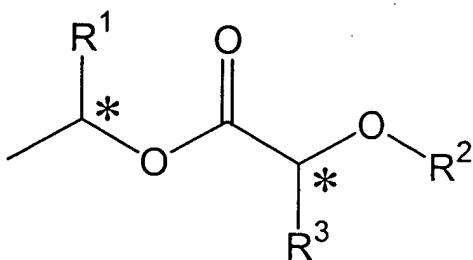
rings T, A and B together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH₂ groups or CH groups are replaced by -N-, NH, -O- or -CO-.

2. The composition of claim 1 wherein CR is selected from the group consisting of:

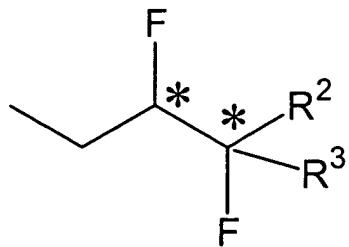


wherein * indicates an asymmetric carbon; R¹ and R³, independently of each other, are lower alkyl or alkenyl groups optionally substituted with one or more halogens, and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

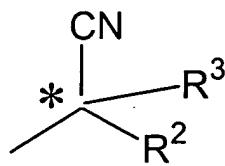
3. The composition of claim 1 wherein CR is:



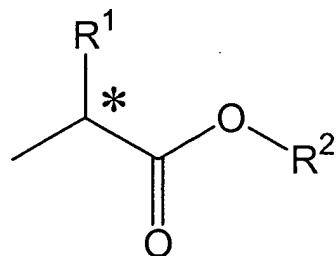
4. The composition of claim 1 wherein CR is:



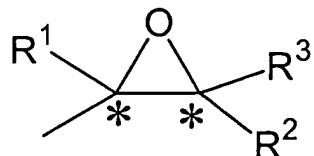
5. The composition of claim 1 wherein CR is:



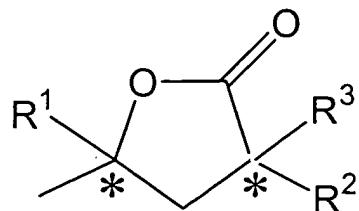
6. The composition of claim 1 wherein CR is:



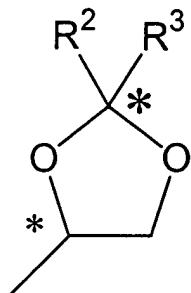
7. The composition of claim 1 wherein CR is:



8. The composition of claim 1 wherein CR is:

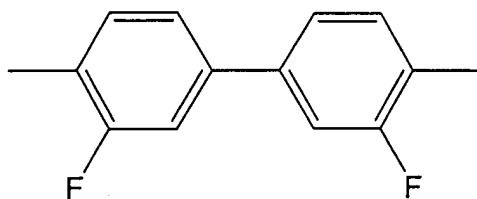


9. The composition of claim 1 wherein CR is:

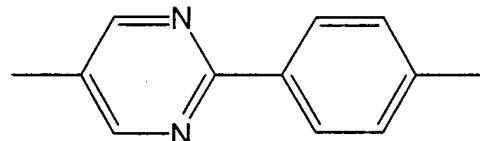


10. The composition of claim 1 wherein the chiral nonracemic compound has a biphenyl mesogenic core.

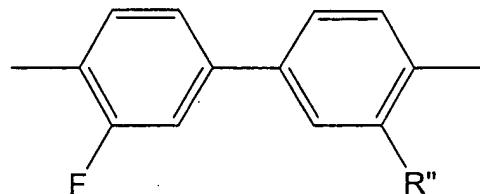
11. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



12. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



13. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



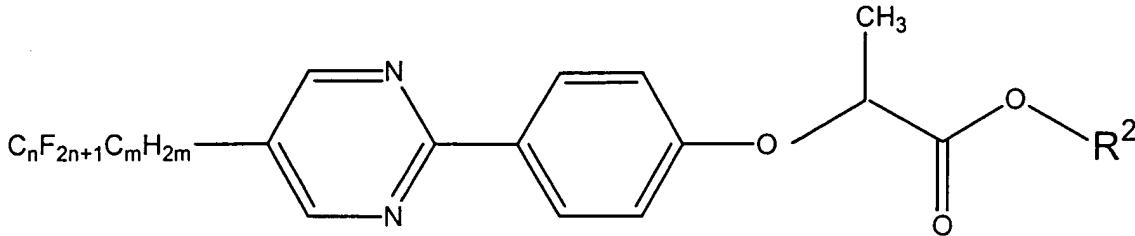
where R'' is a lower alkyl group.

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15. The composition of claim 1 wherein the host is MX6111.

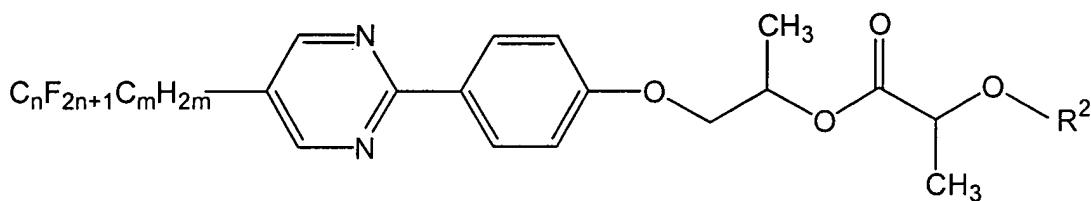
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16. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



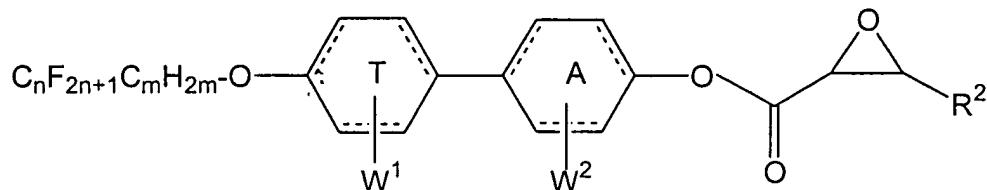
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17. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



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18. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



18

19. The composition of claim 18 wherein in the chiral nonracemic compound both of rings T and A are phenyl rings in which one or two of the CH groups can be replaced with a N and wherein W1 is selected from the group of halogens, alkyl groups or haloalkyl groups.

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20. The composition of claim 1 wherein in the chiral nonracemic compound n = m.

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21. The composition of claim 1 wherein in the chiral nonracemic compound Y is O.

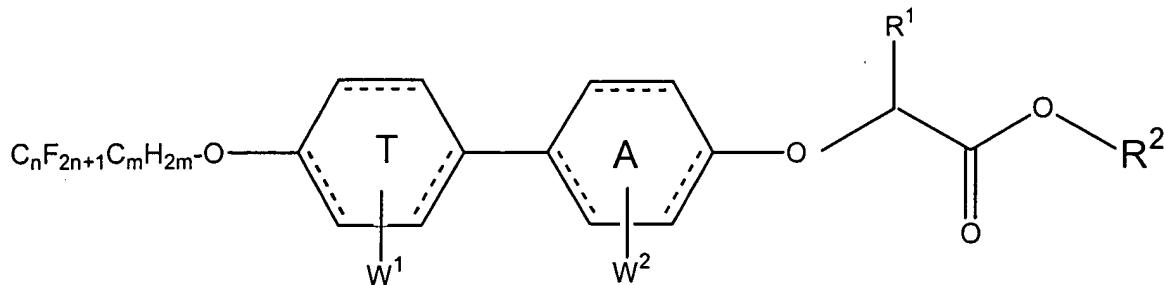
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22. The composition of claim 1 wherein the chiral nonracemic compounds are present in the composition at a level of 10% or less.

23. The composition of claim 1 which has Ps of 10 nC/cm² or more at room temperature.

24. The composition of claim 23 wherein the chiral nonracemic compounds are present at a level of 5% by weight or less.

25. A chiral nonracemic compound having the formula:

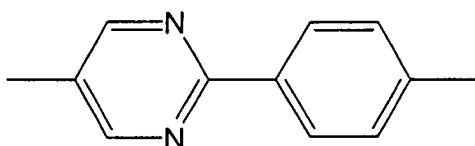


where n and m are integers ranging from 1 to about 15, W¹ and W², independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH₂ groups or CH groups are replaced by -N-, NH, -O- or -CO-; R¹ is a lower alkyl or alkenyl group optionally substituted with one or more halogens and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

26. The compound of claim 25 wherein n = m.

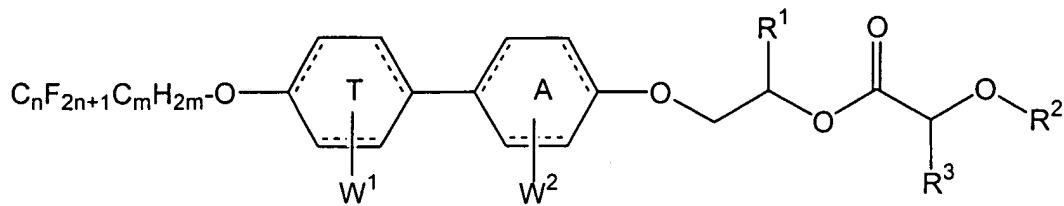
27. The compound of claim 25 wherein R¹ is a methyl group.

28. The compound of claim 25 wherein the mesogenic core is:



29. The compound of claim 25 wherein the mesogenic core is biphenyl.

30. A chiral nonracemic compound having the formula:



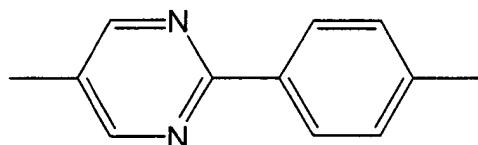
where n and m are integers ranging from 1 to about 15, W¹ and W², independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH₂ groups or CH groups are replaced by -N-, NH, -O- or -CO-; R¹ and R³ are lower alkyl or alkenyl groups that are optionally substituted with one or more halogens and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

31. The compound of claim 30 wherein n = m.

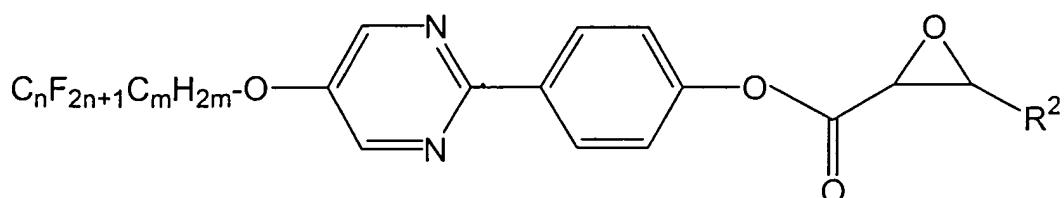
32. The compound of claim 30 wherein R¹ and R³ are both methyl groups.

33. The chiral nonracemic compound of claim 30 wherein the mesogenic core is biphenyl.

34. The chiral nonracemic compound of claim 33 wherein the mesogenic core is:



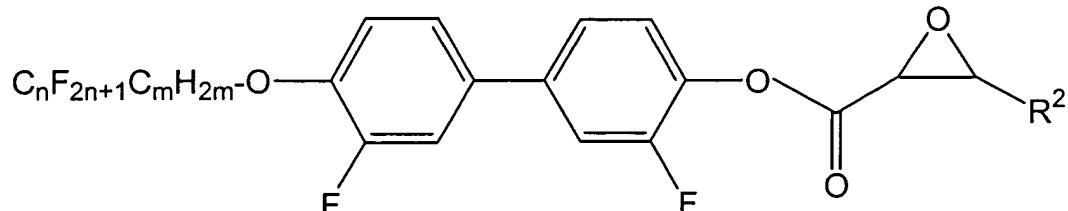
35. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

37. The compound of claim 36 wherein n = m.

38. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

39. The compound of claim 38 wherein n = m.

40. An optical device comprising one or more compounds of claim 1.